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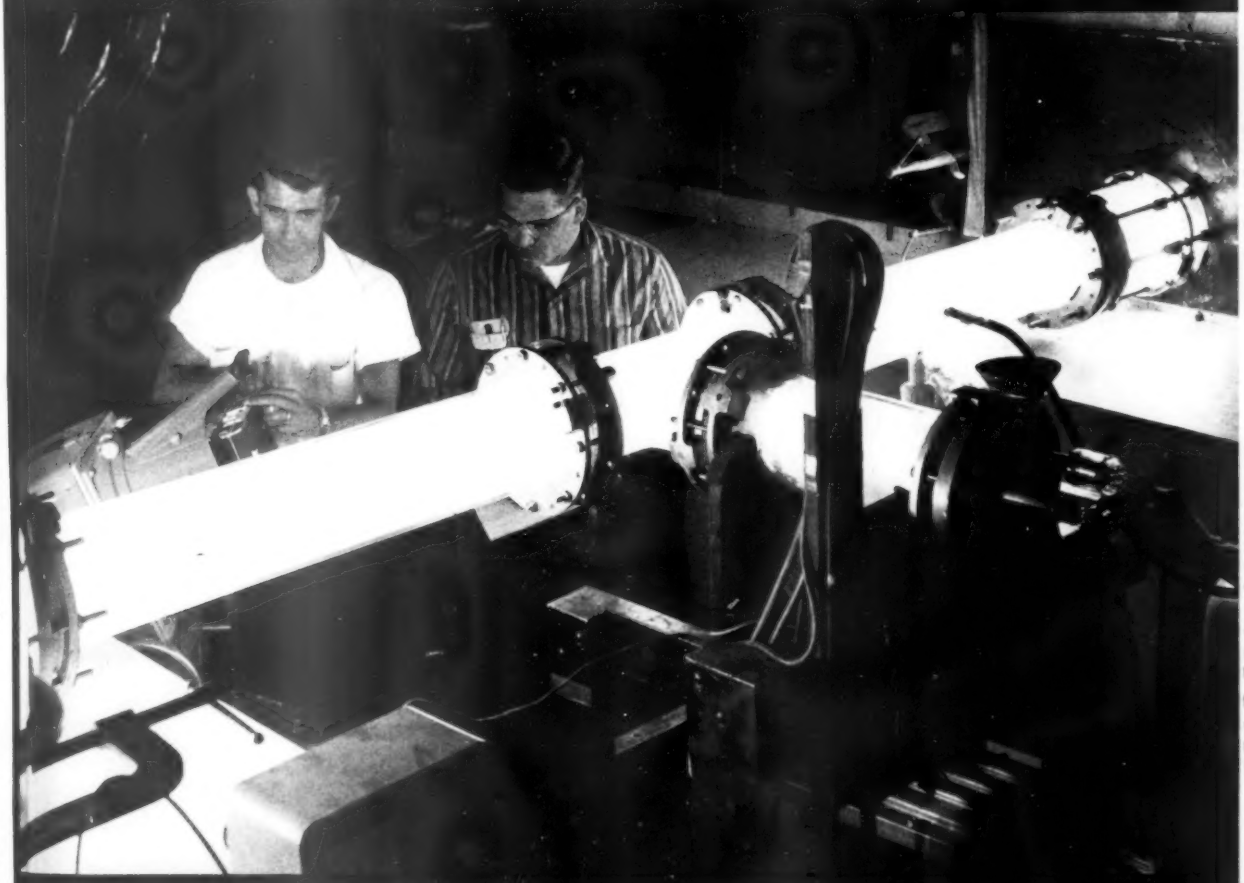

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ASTRONOMY

Million Billion Years Old

Atomic nuclei groupings give clue that universe may be a million billion years old. Stars and galaxy cores can only grow to a limited size.

➤ THE UNIVERSE may be a million billion years old, not just 12 or so billion years old, an astronomer reported.

Dr. Fritz Zwicky of Mt. Wilson and Palomar Observatories told the American Astronomical Society meeting in Mexico City that a million billion years was the least time required for the formation of galaxies, vast stellar systems.

Dr. Zwicky bases his estimate for the age of the universe on the fact that atomic nuclei, the building blocks of matter, react with one another and can radiate. Because atoms react, characteristic groupings of matter are built up. Among these groupings, the stars, of which the sun is only one of millions within the Milky Way, are the most prominent.

Stars cannot grow beyond a certain size because of destructive effects of the energies released when atomic nuclei react, Dr. Zwicky reported. The next higher units of matter are those of the centers of galaxies.

Galactic centers, also, cannot build up beyond a certain size because of certain destructive effects. If they could continue building, they would grow in size indefinitely.

Since there is a limiting size, however, Dr. Zwicky suggests that the cores of galaxies represent a new unit of cosmic matter, the true character of which has not yet been recognized. This character is, however, "just as distinctive as the character of stars," Dr. Zwicky reported.

He described galaxies as follows:

Around a dense and very luminous nucleus, a large disk of much lower brightness is found. The nucleus is some tens of light years in diameter, a light year being the distance light travels in a year at 186,000 miles a second, or some six million million miles.

The disk is surrounded first by a scattered "suburban" population of stars, gas and dust clouds that may be lined up along a number of more or less well defined spiral arms. Around this suburban population there may be a faint halo of stars and dark gases. Finally there are intergalactic formations hovering around the galaxy.

The disk, suburban populations, halos and intergalactic formations have dimensions of a few to many thousands of light years, always much larger than the nuclei of galaxies.

Dr. Zwicky reported that attempts will be made by Dr. John Strong and his associates at Johns Hopkins University in Baltimore to observe the size of the Milky Way galaxy's nucleus in the ultrafar infrared light.

This light is not scattered by the interstellar dust clouds that obscure the view of the Milky Way's center in visual or photographic wavelengths.

He urged exploration of the Milky Way's structure in the ultrafar infrared rays from high-flying balloons or rockets, or from a U-2 plane.

Dr. Zwicky's view that stars are captured and whittled down within the nucleus of galaxies is of great importance for the theory that the universe is in a steady state, with stars being constantly formed. On this basis, he estimates that the age of the universe is more than a million billion years.

• Science News Letter, 78:147 September 3, 1960

SPACE CAPSULE CAPTURED—The Discoverer XIV space capsule is recovered in mid-air for the first time by an Air Force crew in a Fairchild C-119 Flying Boxcar. The recovery equipment used was made by All American Engineering Company, Wilmington, Del.

ROCKETS AND MISSILES

Manned Space Flight From Russia Seen Near

➤ "WE HAVE crossed the threshold of manned space flight," a Russian scientist announced.

As Free World scientists read closely the reports of the USSR's latest space triumph, they were inclined to agree. The Russians —right after the United States successfully recovered capsules from orbiting Discoverer XIII and XIV—topped them with a single massive effort.

The Russian satellite was larger than any U. S. rockets could have put up. Inside the Spaceship were dogs, Strelka (Arrow) and Belka (Squirrel), rats, mice, flies, plants and seeds. Russian scientists watched the dogs' reactions via television.

The Spaceship circled the earth every 90.6 minutes. It was 198.8 miles above the earth. On ground command, during its 18th orbit, its course was changed by small rockets.

Protected by a thermal shield probably like that planned for America's Mercury capsule, the satellite re-entered the earth's atmosphere. Then a capsule, containing the animals, separated and floated down within 6.2 miles of the target area planned, the Russians said.

The animals are well, apparently unharmed by their precedent-breaking flight.

In this Space Age, mice and dogs often are rushed in where man is soon to tread. It now looks as if Russia will soon orbit a man—maybe even two.

• Science News Letter, 78:147 September 3, 1960

ROCKETS AND MISSILES

First Satellite Capsule Recovered in Mid-Air

➤ THE UNITED STATES, like the USSR, has made important re-entry progress. After re-entry similar to that of the capsule of Discoverer XIII, Discoverer XIV's capsule was snagged in mid-air high over the Pacific by an Air Force crew flying a specially equipped Fairchild C-119 Flying Boxcar.

The recovery equipment consisted of two long parallel poles protruding downward from the rear cargo hatch with a long loop of nylon rope slung trapeze-like between the poles. Attached to the nylon rope, at the ends of the poles, were small grappling hooks that snagged the parachute when it was contacted.

When the parachute was engaged, it was reeled into the aircraft with an electric winch.

• Science News Letter, 78:147 September 3, 1960

PUBLIC HEALTH

Wants Law on Pep Pills

➤ ILLEGAL SALES of amphetamine drugs, pep pills, to truck drivers and motorists are adding to the dangers of highway travel.

Reporting on efforts of the Food and Drug Administration to stop nonprescription sales since its crackdown last fall, Commissioner George P. Larrick said bootlegging stimulant pills had become a highly profitable racket. The Commissioner said:

"When we consider that the annual production of amphetamines is on the order of 63,000 pounds—enough to make approximately 5.6 billion 5-milligram tablets, or about 35 tablets for every man, woman and child in the country—it seems likely that a large part of the market for these drugs is through illicit channels."

Emphasizing that the FDA crackdown was not intended to interfere with the proper use of these drugs under medical supervision, Commissioner Larrick warned that unsupervised use "can result in excessive nervous stimulation, loss of desire for sleep, gastrointestinal disturbances, impairment of judgment, hallucinations and mental derangement. And the drugs may have adverse reactions in certain conditions such as high blood pressure, heart disease and diabetes."

Since last fall when the FDA had more than 200 cases of illegal sales under investigation, 85 criminal prosecutions have been completed and 31 additional criminal prosecutions have been instituted. In eight separate actions, 1,837,000 tablets and capsules of amphetamine drugs were seized.

Commissioner Larrick said that 46 of the terminated cases and 12 of those still pending were brought against individuals and establishments not authorized to dispense dangerous drugs, but catering especially to truck drivers. These include truck stops and their operators, grocery stores and other peddlers.

The Commissioner said that circumstantial evidence linking the use of so-called "bennies," "pep pills," or "copilots" with fatal highway accidents has been provided by bottles found on drivers or hidden around the vehicle.

"Amphetamines can be bought wholesale for as little as $2.00 per thousand tablets," he said. "They often sell for $1.00 per dozen."

The need for legislation to strengthen the present Federal law is pointed up in the FDA report.

• Science News Letter, 78:148 September 3, 1960

PUBLIC HEALTH

Malaria Still a Problem

➤ MALARIA still exists in about 30% of the Americas, the Pan American Health Organization-World Health Organization has reported in Havana at the 12th annual meeting of the directing council of PAHO.

To date, WHO's efforts to blot out malaria in every corner of the world have freed nearly 53,000,000 persons from the threat of the disease in the Americas alone. Another 9,000,000 are in areas under surveillance to see if eradication methods have stamped out the disease.

Malaria is completely eradicated in Chile, the United States, Barbados, Martinique and Puerto Rico. Other countries have stopped the disease in isolated areas or large sections.

In Canada, Uruguay, the Bahamas, the Virgin Islands and several other islands, the disease never existed or has disappeared without eradication measures.

In more than 22% of the Americas area, eradication measures are in full swing. Houses are being sprayed with dieldrin and DDT to kill the 20 species of anopheles mosquitoes that carry maralia. In areas such as the Amazon Basin where houses have no walls, the natives are using salt with an antimalarial drug added.

National budget appropriations in 1960 for eradication programs have almost doubled in Colombia and Jamaica since 1958. Mexico, which is still spraying houses periodically, has the largest single antimalaria budget for 1960—$6,720,000.

The 8.6% of the Americas area not presently engaged in eradication programs lies largely in Brazil, a vast country with more than its share of malaria problems because of the remote Amazon Basin and the country's size. Cuba has not started active spraying, but is making a preliminary survey, and Haiti's campaign was temporarily interrupted by economic difficulties.

• Science News Letter, 78:148 September 3, 1960

PUBLIC HEALTH

U. S. Not Among Nations Giving Medical Care

➤ WITH 127,000,000 Americans covered by some form of voluntary health insurance, the United States is notably absent from the list of 59 nations providing medical care under a more or less compulsory social insurance system.

Joseph F. Follman Jr., representing the Health Insurance Association of America, told the American Pharmaceutical Association in Washington, D. C., that the subject of Government medical care has been under consideration intermittently since 1927 when President Hoover appointed a committee on the costs of medical care.

Mr. Follman said the reason the U. S. has not enacted a medical care program is partly due to the high standards of medical care already given. Some of it is given by state and local communities, particularly to the needy.

More important perhaps is the existence of voluntary agencies and voluntary health insurance, he said.

But oddly enough, after 12 years of the National Health Service in Great Britain, voluntary health insurance has grown to the point where it covers some 25% of the population, Mr. Follman said.

"Membership in the British United Provident Association alone has increased over ten-fold since 1949."

The first known government insurance scheme became effective in Germany in 1883, Mr. Follman said.

All nations in Europe except Finland have some type of government health and maternity program.

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TECHNOLOGY

Energy From Sun-Pools

Pools of salted water can provide underdeveloped countries with cheap energy, the first International Conference on Science in the Advancement of New States reported.

➤ A NETWORK of sunshine reservoirs, pools of salted water storing up the heat of the sun, can provide arid underdeveloped countries wtih an easily available and economic source of energy, an Israeli scientist has reported.

Dr. Henry Tabor of the National Physical Laboratory of Israel, authority on solar energy, reported on his new plan for "pooled" solar power to the scientists and statesmen meeting at the Weizmann Institute of Science, Rehovoth, Israel, for the first International Conference on Science in the Advancement of New States.

In the new scheme, salts would be dissolved in water at the bottom of a square pool, two-thirds of a mile on a side. Then the heat of the sun would concentrate and remain at the bottom because the heaviness of the salted water would prevent the heat from rising to the surface. The surface layer of the pool, however, would remain at a constant temperature since it would lose heat at the same rate it picks it up. The success of the operation would depend only on keeping the water in the pool undisturbed.

Construction costs are estimated at about $1,000,000. The investment would yield a return in heat energy valued at $250 per kilowatt, producing electricity at one-tenth the cost of any other solar apparatus to date.

Dr. Tabor does not believe the development and use of solar energy will be adopted by the developed areas of the world; but it may provide the economic independence so eagerly sought by the arid underdeveloped regions of the world which boast little else in the way of natural resources than the blazing energy of the sun.

He predicted that in the future this heat may be converted to energy that paradoxically will supply air-conditioning and refrigeration.

Dr. Alvin M. Weinberg, director of the Oak Ridge National Laboratory, Tennessee, and winner of the Ford Atoms for Peace Award, hailed Dr. Tabor's scheme for a solar pool built upon the principle of water density as "the most important theory so far presented" at the Conference.

An authority on nuclear energy, Dr. Weinberg warned that making the sun or any other energy source pay off will require adequate financing operations.

The underdeveloped countries of the world must look to foreign investment and capital for the financial energy needed to develop physical sources, Dr. Weinberg said. The economic self-sufficiency sought by the new states through power development will contribute to world peace and stability as well as to national stability.

Another source of energy independence for the new states is the use of breeder reactors, Dr. Weinberg said. Such reactors can be fueled with residual uranium and thorium which exist everywhere in the earth's crust. He predicted that energy independence among the nations of the world would eliminate access through the Suez to the Middle East as "a major political issue."

• Science News Letter, 78:149 September 3, 1960

GEOPHYSICS

Two Baffling Problems Solved by Scientists

➤ TWO PROBLEMS that have baffled scientists for generations have been solved by mathematicians at the Weizmann Institute of Science, Rehovoth, Israel.

One is the theoretical determination of ocean tides; the second is the calculation of the earth's resonance frequency.

Two famous French mathematicians, Laplace and Poincare, tried in the late 18th and early 20th centuries to find a formula for the tides. Prof. Chaim Leib Pekeris, head of the Institute's department of applied mathematics, has now produced the answer.

His comprehensive solution was possible only because of recent development of electronic computers. Prof. Pekeris and an assistant found a theoretical solution for the height of the tide at any port in the world that agrees well with actual measurements.

Prof. Pekeris, with Dr. Ziporah Alterman and Hand Jarosch, also calculated theoretically the resonance frequency of the earth. Their solution was confirmed by observations made during the Chilean earthquake in May, 1960, and is expected to prove important in detecting nuclear explosions and seismic disturbances.

Resonance frequency occurs when a body is "excited" and emits a natural tone and overtones, as when a tumbler is struck by a spoon. The larger the body, the lower the pitch. The earth's resonant frequency is so low it is inaudible, but it can be detected by the seismic instruments that record earthquakes.

Prof. Pekeris and his associates found that the first frequency of the earth is 53.4 minutes and the first overtone 35.6 minutes. During the Chilean earthquake the theories of the Weizmann Institute group were checked against measurements made by United States scientists at California Institute of Technology and the University of California at Los Angeles.

All the seismic records tallied with the theories, except for very small differences.

• Science News Letter, 78:149 September 3, 1960

NUCLEAR HONEYCOMB — This nuclear assembly holds more than 4,000 uranium-aluminum foils as fuel. Chain reactions in the assembly will provide scientists at General Dynamics Corporation, San Diego, Calif., with data for development of the maritime gas-cooled reactor.

SOCIOLOGY

Better Life Is Goal of Underdeveloped States

➤ A BETTER LIFE on earth, not a trip to the moon or other planets, is the goal of the Asian and African delegates to the International Conference on Science in the Advancement of New States in session at the Weizmann Institute of Science, Rehovoth, Israel.

Finance Minister Dr. S. E. Imoke of Eastern Nigeria, which will become an independent nation on Oct. 1, expressed the hope that countries from the Eastern bloc, especially the Soviet Union, would join in the attempt to harness scientific and technological knowledge for the less privileged on earth before proceeding with ambitious programs in outer space and trips to the moon.

He said, "We do not ask for the moon . . . all we seek is guidance, assistance and cooperation in our efforts to extract from the resources of our countries a more abundant life."

The Afro-Asian delegates have asked that high priority be given to discussion of such basic problems as high mortality, relief from hunger, primary and secondary education, and advanced research on development of industry or commerce relating to economic requirements.

Their request was underscored by the urgent plea of Rev. Solomon Caulker, vice president of University College, Sierra Leone (scheduled for independence from Britain, April 27, 1961), who asked the Conference to take up specific problems of countries like his own "where eight out of ten babies are doomed to die within the first year of their life."

• Science News Letter, 78:149 September 3, 1960

PUBLIC SAFETY

Radiation Investigation

➤ CONGRESSIONAL INVESTIGATION may be expected because of an Administrative order permitting any Federal agency to set up its own radiation protection guides.

The individual jurisdiction and the "do-it-yourself" safety procedures for agencies in atomic work was recommended by the Federal Radiation Council and accepted and approved by President Eisenhower.

The Federal Radiation Council through its chairman, Secretary of Health, Education and Welfare Arthur S. Flemming, submitted to the President on May 13, 1960, a memorandum on radiation protection guidance for Federal agencies.

This was the Council's first report on its statutory responsibility under Executive Order 10831 and Public Law 86-373 to ". . . advise the President with respect to radiation matters, directly or indirectly affecting health, including guidance for all Federal agencies in the formulation of radiation standards and in the establishment and execution of programs of cooperation with States . . ."

Sen. Clinton P. Anderson (D-N.M.), chairman of the Joint Committee on Atomic Energy, said that Congress had expected from the Council more uniformity rather than diversity in setting up radiation guides.

He said, "The trend should be toward uniformity; and one Federal agency should decide and be responsible for the establishment of radiation standards or guides.

"If any deviation of these standards is deemed necessary by an agency, application should be made to the controlling agency which should decide the requested change and give written reasons for its decisions."

The Council recommended in general terms the "Radiation Protection Guides" to be used by the agencies "for normal peacetime operations." The final recommendation of the Council states that agencies should adhere to the guides "with judgment and discretion" but that "the Guides may be exceeded only after the Federal agency having jurisdiction over the matter has carefully considered the reason for doing so in light of the recommendations in this paper."

Dr. Donald Chadwick of the U. S. Public Health Service and Secretary to the Federal Radiation Council said that this final recommendation does, in fact, allow each agency the freedom to determine its own safety standards "weighing the benefits against the risks." He justified the independence of judgment allowed the agencies by the Council on the ground that one standard cannot apply to all radiation uses.

• Science News Letter, 78:150 September 3, 1960

TECHNOLOGY

Noise Problem in Jet Age

➤ SILENCE STILL IS GOLDEN. In fact, it may be priced beyond reach in this noisy jet and rocket age.

The role of economics in getting rid of today's increasing noises was pointed out by Dr. Richard H. Bolt, professor of acoustics at the Massachusetts Institute of Technology and associate director of research for the National Science Foundation, in testimony before the House Committee on Science and Astronautics at hearings on the effect and control of noise.

The annoyance level of noise, or what Dr. Bolt defines as "unwanted sound," is determined by much more than just intensity. Most persons, for example, enjoy the loud rush of a waterfall while the relatively small whine of a mosquito is often intolerable.

Noises made by jets and rockets certainly are "unwanted sounds," particularly unwanted by those who live near airports and launching facilities. But these noises are here to stay, Dr. Bolt said, unless the high performance and advantages of swift travel of supersonic aircraft are sacrificed.

"The noise from these powerful sources, when off the ground, can be reduced by only a small margin without incurring severe penalties in performance." On the ground, jets and rockets can be muffled to almost any extent, "limited only by dollars."

The national investment in combating noise has been from twenty to twenty-five million dollars in the past 15 years. The bulk of this support has come from the armed forces and the National Advisory Committee for Aeronautics, now superseded by the National Aeronautics and Space Administration.

Ira H. Abbott, director of NASA's office of advanced research programs, told the Committee that "it is reasonable to expect a solution to this problem."

Dr. Bolt said progress in combating the noises made by new machines is counterbalanced by advances in their development that make them work better but noisier.

"Acoustic perfume," the substitution of a preferred sound (music, waterfalls) for a noisy unwanted one, was suggested by Dr. Bolt as a method that has proved successful in lessening the impact of noise.

It has proved successful in dentistry, he noted, where dentists have employed an "audiac," a device whereby the sound of the drill is obscured for the patients by music and other pleasing sounds.

It also has been found that air-conditioning in homes near airports lessened the impact of noisy take-offs and landings.

Dr. Bolt suggests major advances will be made through nation-wide planning for aviation facilities, airports and areas abutting sources of noise.

"Although it must incorporate scientific information," he said, "such planning is not a subject of scientific research. It is one of national understanding and coordinated action."

However, at the present time, the national regulations set by the Federal Aviation Agency for noise reduction for airports and facilities allow for greater exposure to noise than do the airport regulations set by the New York Port Authority.

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PUBLIC SAFETY

President Will Review Radiation Standards

➤ PRESIDENT Eisenhower will re-examine the recommendation by the Federal Radiation Council concerning the do-it-yourself provision that now permits each Federal agency in atomic work to set its own radiation standards.

He made this announcement at his news conference in answer to a query from SCIENCE SERVICE asking if there was any reason why the agencies were allowed this discretion without review and approval by the Federal Radiation Council.

The Council originally was established to set radiation standards for all agencies. It was hoped this would eliminate the danger of conflict of interest that might occur within an agency between the setting of its safety standards and its function in nuclear development.

The President's answer: "Well, as a matter of fact, the question is sensible because I assume . . . that there could be some confusion here if any excess radiation were allowed to escape and were not reported to the proper people. If the order is defective, I will try to find out about it."

• Science News Letter, 78:150 September 3, 1960

MEDICINE

Radioactive Gas Used To Detect Heart Holes

➤ CARDIAC SHUNTS — the dangerous mixing of oxygen-poor blood and oxygenated blood through holes in the partition between the left and right sides of the heart—have been successfully detected and located with a radioactive gas, krypton-85.

Drs. R. T. L. Long, Eugene Braunwald and A. G. Morrow of the National Heart Institute, Bethesda, Md., have used the technique on 48 patients.

To detect left-to-right shunts, a small tube is used to inject krypton-85 into the left heart. If there is leakage, the gas crosses directly to the right heart and is pumped directly to the lungs. Thus, a high concentration of the gas in exhaled air will reveal the shunt. The radiation of the expired air can be monitored by a count-rate meter.

The gas is injected into the right heart to detect right-to-left shunts. If there are none, the gas would be pumped to the lungs and expired. If there are shunts, the gas leaking into the left heart is pumped into the arteries, where arterial blood samples will reveal its presence.

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MEDICINE

Knee Noises Give Clues

▶ A MICROPHONE applied to that creaky knee is an aid to diagnosing rheumatoid arthritis conditions before they have progressed far enough for X-ray detection, a Chicago physician reported. He said normal and rheumatoid knees sound different.

Dr. Herbert Fischer of the Rehabilitation Institute of Chicago told the Third International Congress of Physical Medicine in Washington, D. C., that when he fastened a sensitive microphone to the knees of volunteers, he found rheumatoid knee joints produced a low thud.

A series of high frequency bursts at irregular intervals was produced by knees with the degenerative joint disease osteoarthritis. Normal knee joints, however, produced sounds that were relatively uniform in intensity, frequency and wave pattern.

Help for Hemophiliacs

▶ HEMOPHILIACS (profuse bleeders) whose joints and muscles have been damaged by bleeding can have motion restored by physical therapy.

Dr. Elizabeth Austin of the hemophiliac clinic, California Hospital, Los Angeles, told the Third International Congress of Physical Medicine in Washington, D. C., that ultrasound therapy, electrical stimulation and carefully graded exercise programs had been used in the clinic to restore motion.

Dr. Austin said a study of 35 patients, ranging in age from three to 33, had indicated that augmenting the traditional bed rest, traction and splinting with physical therapy produced far better results than would otherwise have been predicted.

• Science News Letter, 78:151 September 3, 1960

MEDICINE

Polio Vaccine by Mouth Ready for Use in 1961

➤ LIVE POLIO virus vaccine will be available for mass inoculations in 1961. Now that the U. S. Public Health Service has recommended that the vaccine of Dr. Albert B. Sabin of the University of Cincinnati be made by potential manufacturers, there will be two polio protection methods in use next year.

The Salk vaccine administered by injection has been widely used for several years, while the Sabin method, a vaccine taken by mouth, has so far had mass tests in two U. S. cities.

Legal regulations on live polio virus will not be completed before Nov. 1, but the manufacturers working with technical details will be able to get under way now.

Dr. Roderick Murray, chairman of the PHS Committee, explains that the Sabin Type I and Type II strains possess the most favorable laboratory and field characteristics, and his Committee has recommended their use.

Sabin Type III strain is also recommended although continued search for a superior Type III strain is urged. All the live polio virus vaccines so far used in this country are safe for humans, but all "candidate strains" except those of Sabin, which have been extensively studied, are of "greater neurovirulence for monkeys." Any vaccine that paralyzes monkeys is considered potentially dangerous for man.

Dr. Murray called attention to the great contributions of Dr. Herald Rea Cox of Lederle Laboratories, and of Dr. Hilary Koprowski of Wistar Institute, Philadelphia, formerly with Lederle.

Originally it was hoped that one oral dose of the live vaccine would be all that was necessary for permanent immunization against polio. Now it is planned to give three or four oral doses, possibly a different strain for the first three doses, and a combined or "trivalent" dose as the final one. Cost is estimated to be less than for the Salk vaccine.

Mass inoculations are recommended, but the details are to be worked out with state health departments and local communities.

The Salk killed vaccine requires three and preferably four injections.

• Science News Letter, 78:151 September 3, 1960

PLASTIC IN HEART SURGERY—A plastic blood filter (center) that can be sterilized by steam heat, instead of by "cold" sterilization methods, is connected to the heart-lung machine. The filter was manufactured by Bonny Manufacturing Corp., Mayard, Mass., from a special plastic supplied by the Minnesota Mining and Manufacturing Co., St. Paul, Minn.

SURGERY

Plastic Blood Filter Helps Open-Heart Surgery

➤ A PLASTIC arterial blood filter that can be sterilized like a test tube has been developed for use during open-heart surgery. Made of a non-wettable halofluorocarbon plastic, the filter needs no silicone treatment before each use and can be sterilized by steam heat in an autoclave, rather than by the tedious "cold" sterilization process used for delicate glass filters.

The transparent plastic, which remains unfogged even after several hundred autoclavings, is important in the filtering unit because the blood must be observed through windows as it flows through the stainless steel filter screen. Air bubbles, which can cause air-embolism in the patient, can be spotted and released through two small vents on top of the unit.

Dr. Alvin A. Bakst and Dr. Phillip Crastnopol of Jewish Hospital, Brooklyn, N. Y., have been using the filter "with eminent success" in open-heart operations.

• Science News Letter, 78:151 September 3, 1960

GENERAL SCIENCE

Maritime Industry Weak

➤ THE LAGGING United States maritime industry will require a big research program to compete successfully with foreign ships, the Maritime Research Advisory Committee of the National Academy of Sciences-National Research Council reported.

U. S. flag ships now carry only one-tenth of our sea-borne commerce. This means that at a time when the cold war is expanding, the country is in the vulnerable position of having to rely on foreign fleets for most of its ocean shipping needs.

Concern over this prompted the U. S. Maritime Administration to ask for a study and recommendations from the Academy's Maritime Research Advisory Committee of 55 senior scientists and engineers, headed by Louis H. Roddis Jr., president of the Pennsylvania Electric Company.

Automation is the principal means of achieving the goal of a U. S. merchant fleet of such technological superiority that it could compete independently in international trade without requiring Government support by subsidies, the Committee reported.

It recommends that the Maritime Administration request appropriations of 10 to 12 million dollars anually during the next decade for research conducted through outside contracts, particularly by universities, in order to promote maritime-related education. The Maritime Administration is urged to encourage the maritime industry itself to invest more money in research.

The Committee's conclusions and recommendations range from a suggestion to study bridge-to-bridge radiotelephones to establishing a mathematical model for the prediction of future world shipping requirements.

Other major conclusions and recommendations by the Committee include:

1. One of the most serious problems of the U. S. merchant marine is the high cost of U. S. shipbuilding. Savings can be made through simplification and standardization in design. Government policies leading to more efficient shipyards should also be fostered.

2. The Maritime Administration should frequently sponsor the construction and operation of advanced concept ships that can demonstrate the feasibility of new developments. Such ships built within the near future should incorporate automation of most shipboard operations, unitized cargo operation and more economic machinery.

Prof. Harry Benford of the Academy-Research Council staff served as executive director of the Committee study.

• Science News Letter, 78:152 September 3, 1960

ASTRONOMY

Supports Planet Theory

➤ NEW EVIDENCE has been reported to support the theory that the earth and other planets were formed by condensation of material once a part of the sun.

Dr. Thomas Gold, head of the astronomy department at Cornell University in Ithaca, N. Y., said the high amounts of lithium on earth compared to the sun suggest that the solar system planets were previously part of a far-flung disk of the sun.

He believes that a careful search of the heavens might reveal a star and its surrounding material in a state corresponding to that before the sun's planets condensed.

Dr. Gold's theory is based on a recent observation by Dr. W. K. Bonsack of California Institute of Technology and Dr. J. L. Greenstein of Mt. Wilson and Palomar Observatories that certain stars whose brightness varies irregularly are abnormally rich in lithium.

They estimate there is at least ten times as much lithium per ounce of material on the surface of these stars as there is in the surrounding material.

Because of this high abundance of lithium, Drs. Bonsack and Greenstein suggest that these stars must be capable of manufacturing this element, the lightest of all known metallic elements. One such manufacturing process could be through high-energy magnetohydrodynamic processes in the star's atmosphere, resulting from the release of energy residing in the original magnetic field.

Dr. Gold now proposes that the sun in its early stages would, as a result of shedding its magnetic energy, have formed an atmosphere rich in lithium as the T Tauri variable stars are observed to do. The planets then formed out of this solar material would have a high abundance of lithium, he suggests in the Astrophysical Journal, 132:274, 1960, published in collaboration with the American Astronomical Society.

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MEDICINE

HEW Official Named Lasker Award Winner

➤ THE DIRECTOR of the Office of Vocational Rehabilitation of the U. S. Department of Health, Education and Welfare, Mary E. Switzer; Dr. Paul W. Brand, a missionary at Vellore, South India, and Dr. Gudmund Harlem, Oslo, Norway, have been named winners of the Albert Lasker Awards, one of medicine's highest honors.

The awards will be presented to the winners Sept. 1 at the Eighth World Congress of the International Society for the Welfare of Cripples in New York. They are given every third year by the Albert and Mary Lasker Foundation through the International Society "for outstanding achievement in the development of services for the physically disabled."

Of Miss Switzer the awards committee said, "During the ten years of her leadership, approximately three-quarters of a million disabled persons have been rehabilitated to useful employment in the United States."

Of Dr. Brand, medical missionary and orthopedic surgeon, the Committee said, "In 1947 he performed his first operation on the hands of patients with leprosy, transplanting healthy tendons to do the work of paralyzed ones."

Dr. Harlem, Royal Minister of Health and Social Affairs of Norway, the Committee hailed as an "articulate spokesman for and champion of human dignity and social justice throughout the world . . . a man of action in the Norwegian resistance movement."

The awards consist of $2,500 each, a citation and a silver statuette of the Winged Victory of Samothrace, symbolizing victory over death and disease.

• Science News Letter, 78:152 September 3, 1960

NUTRITION

If Well Fed, Avoid Overdoses of Vitamins

➤ IN A STRONG EDITORIAL, the Journal of the American Medical Association, 173:1831, 1960, warns well-fed Americans against gulping down vitamin pills.

The editorial says overdoses of vitamin A can lead to irritability, skin eruption, enlargement of the liver and loss of appetite. Too much vitamin D may cause gastrointestinal symptoms.

The Journal says that "only in a deficiency state or in an anticipated deficiency state are vitamin supplements necessary."

• Science News Letter, 78:152 September 3, 1960

GENERAL SCIENCE

About $1,000,000,000 Spent for Basic Research

➤ ABOUT A BILLION DOLLARS was spent in the United States on scientific research and development during the 1959-1960 fiscal year, the National Science Foundation estimates.

The estimate is based on a statistical evaluation of the money spent for basic research in the U. S. during the period from 1953 through 1958, reported for the first time. This statistical series shows that, throughout the period, the funds spent for basic research were about eight percent of the total expended for all research and development. The total spent for basic research increased from $430,000,000 in 1953 to more than $830,000,000 in 1957-58.

The survey was made to provide a factual background for the formation of U. S. scientific policy, a primary responsibility of the National Science Foundation. Detailed and summary survey information is now available on major aspects of research and development in various types of organizations throughout the economy, the Foundation reports.

These organizations are grouped into four: colleges and universities, other nonprofit institutions, industry, and the Federal Government.

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PSYCHIATRY

Swindlers Analyzed

▶ A SWINDLER, no matter how fantastic the personality, wealth, titles and distinctions he has invented for himself, is not usually mentally deranged, Dr. Edward Podolsky of Brooklyn, N. Y., a psychiatrist, has concluded from a long series of studies.

The swindler, he says, is what a psychiatrist would call a psychopathic personality, or sociopath. He is suffering from a character disorder. He is morally deficient in all social values that make for effective and socially useful living.

As a rule the swindler is successful because he can read the mind of his victim, Dr. Podolsky reported in the Medical Annals of the District of Columbia, 29:392, 1960. The swindler feels confident of his ability to influence his victim's thinking. This is accomplished by dimming the common sense and judgment of the victim.

The swindler arouses and stimulates the greed of his dupe with such consummate skill that the victim's conscience, logic, common sense and judgment are completely overwhelmed.

Thus the swindler is able to gain control of the conscience of the victim. He takes advantage of the fact that there is a little bit of greed in everyone's character and almost everyone is on the lookout for a big financial scoop, a quick and easy profit.

After a swindle it is the victim, not the swindler, who is likely to have a feeling of guilt. This realization that they themselves are not free from guilt keeps many victims from complaining to the authorities. The swindler can then pursue his career with very little interference.

A long series of studies of the behavior of swindlers have revealed to psychiatrists some of the elements that are part of the psychic constitution of the swindler:

1. Inability to postpone. When the swindler wants something, he wants it without delay. He does not stop to consider consequences and so is not deterred by what might deter the normal person.
2. Ineffective consideration of consequences.
3. Insufficient learning from experience.
4. Disproportionate responsiveness.
5. Emotions very often dominate intellect. In this way, as in others, he is immature.
6. Devaluation of reality.
7. Disregard for truth.
8. Insufficient social valuation.

The swindler is more self-centered than the normal individual. His mental processes appear to behave in a less mature fashion than others. He has a total disregard for others. The swindler is completely absorbed in the immediacy of his activities.

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ROCKETS AND MISSILES

Mice and Men in Space

▶ NEITHER MICE, monkeys, nor men will be rushed into outer space by the United States.

An animal will not be launched in Discoverer XV, despite earlier reports that it would house a monkey, the Air Research and Development Command reported to SCIENCE SERVICE.

Discoverer XV, like the Discoverer XIV, will contain only advanced engineering tests giving complete, recorded data on the pattern and behavior of its round-trip excursion into space and back—if successfully recovered. It will contain no living organisms.

Lt. Gen. Bernard Schriever has said that continued successes with the Discoverer series probably will be followed with an attempt at an orbital launch and recovery of a tiny spider monkey in the space capsule. The Discoverer capsule will not hold a much larger animal.

Three small, long-gone black and brown mice were part of the first U. S. attempt to orbit and recover animals from outer space. They were launched in an early Discoverer satellite, Discoverer III; and though separated from the vehicle, they did not find their way back home.

The Air Force still is breeding these dark-haired "moustronauts" for future space experiments. They are preferred over the more commonly used white mice because the dark coloring will reveal effects of radiation by bleaching or graying the hairs. These effects would not be detectable on the white mice.

Whether mice or monkeys go up in future Discoverer launches, they will, if recovered, reveal important physiological responses to the stresses of space important for future manned flights. U. S. manned flight is under National Aeronautic and Space Administration's Project Mercury.

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PALEOBOTANY

Origin Theories May Be Upset by Liverwort

▶ THE STONE REMAINS of a little liverwort, one of the world's most common plants, may upset scientists' theories about how long life has existed on earth. Discovered in the Catskill Mountains by graduate student Francis M. Hueber working under Prof. Harlan P. Banks of the New York State College of Agriculture, Ithaca, N. Y., the fosil was found to date back 330,000,000 years to the Age of the Fishes.

The discoverers believe that since the plant must have been evolving for millions of years before it reached the development shown in the fossil, liverworts may have existed as far back as the Cambrian Age. This would mean that land plants and perhaps life itself have a longer history on earth than scientists have thought.

• Science News Letter, 78:153 September 3, 1960

GEOPHYSICS

French Nuclear Test Detected in U. S.

▶ THE RADIOACTIVE DEBRIS from the test explosion of an atomic device by the French Government in the Sahara Desert last February was detected in the United States about two weeks later, two U. S. Naval Research Laboratory scientists report.

The atomic debris from the French nuclear test was blown in an easterly direction three-quarters of the way around the world before it was found through analysis of air samples taken at several stations along the 80th meridian west.

The atomic device fired on Feb. 13 made France the fourth nation to join the nuclear weapons club, the exclusive group to which only the U. S., Russia and Great Britain formerly belonged.

The Sahara explosion brought to reality one long-dreaded nightmare of scientific and diplomatic experts—the predicted possession of nuclear weapons by other than the three great powers. Since shortly after World War II, this has been considered the "N'th country problem," the "N" representing an unknown number.

Drs. R. L. Patterson Jr. and L. B. Lockhart Jr., of the U. S. Naval Research Laboratory, Washington, D. C., found from their air filter analysis that the radioactive debris from the French nuclear test spread from a few degrees south of the equator to just above 25 degrees north latitude by the time it reached the 80th meridian.

The second atomic test, which was much smaller, was not detected at the 80th meridian stations, they report in Science, 132:474, 1960. The stations are located at Miraflores in the Panama Canal Zone, San Juan, Puerto Rico, Miami, Fla., and Guayaquil, Ecuador.

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PHYSICS

Collision of Shock Waves 80 Times Sound's Speed

See Front Cover

▶ THE COLLISION of two shock waves, both traveling 80 times faster than sound at the time of impact, illuminates the shock tube seen on the cover of this week's SCIENCE NEWS LETTER.

The shock waves, one triggered at the left end of the tube and the other at the right, moved towards the center of the tube at initial velocities about 300 times the speed of sound.

The waves collided at a point between the two rings midway down the tube. By the time they reached each other the shocks had slowed to 80 times the speed of sound.

The shock tube was built by Boeing Scientific Research Laboratories.

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GENERAL SCIENCE

Origin of the Scientist

Studies of science-talented young people show that drive towards science starts early. Opportunities in school, home and community are important in developing ability.

By SHIRLEY MOORE

➤ A MOST ESSENTIAL ELEMENT in the origin of a scientist—his intense and continuing interest in exploring the puzzles of the universe—probably develops before he has ever had a high school course in science or mathematics.

Ninety-five percent of the 356 young finalists at the 11th National Science Fair-International this year were science-oriented by the time they were 14 years old and, presumably, had begun ninth grade.

This important initial interest in science had been catalyzed in 63% even before they entered seventh grade.

Seventeen percent were potential scientists before they opened their first grade readers.

These facts are drawn from the files of SCIENCE SERVICE, which conducts the annual event for outstanding high school sophomores, juniors and seniors from regional and area science fairs all over this country and abroad.

The records show that classroom courses, experiences provided in school or the influence of individual teachers sparked the original drive of one-third of the National Science Fair finalists. One example cited was a teacher of the second grade who had a nature table in her classroom to which all the boys and girls in the class contributed.

Homes Stimulate Science Interest

The families and home environments of nearly one-fourth, 23.6%, of the talented young people stimulated their bent toward science. Parents whose own response to science was enthusiastic and who made books, materials and opportunities a natural part of their children's lives were most frequently mentioned as having fostered interest and growth in science activities.

The Kethley family of Decatur, Ga., illustrates the lively details that may be involved in the care and feeding of young scientists. During the past six years the three young Kethleys have exhibited 20 science fair projects and have brought home 18 ribbons, five gold keys, four medals, a plaque and a number of other prizes and honors.

John Bryan Kethley, 17, was a National Science Fair-International finalist in 1958 at Flint, Mich., and again in 1960 at Indianapolis. His most recent project work on the stem strength of *Vicia faba* plants included peeling 400 of the beans before planting them in crushed granite in a large herbarium on the kitchen table. For the sake of the beans, the Kethleys did without furnace heat and air conditioning in the kitchen. They also ate soup every Saturday for three years, because weekly sessions with the bean project in the kitchen made more elaborate meals impossible.

According to his mother, "John does not think of Stone Mountain as the world's largest hunk of exposed granite. He thinks of it as a source of crushed rock for growing beans. He has used two-fifths of a ton of granite, and has spent about 2,300 hours growing and testing 3,000 beans in 400 boxes which were sterilized in the dishwasher."

John's father, Prof. Thomas W. Kethley, head of the Bioengineering Branch at Georgia Institute of Technology, has not only encouraged his own brood but also has worked with the Georgia and Atlanta Science Congresses for many years, probably counseling more young people toward success in science activities than has any other scientist in the state. Mrs. Kethley claims no scientific ability or training, only dedicated enthusiasm as an audience.

Although John has been exposed to science all of his life, he reports that his own interest became focused when he was 12

FUTURE SPACE SCIENTIST—David Joel Wilson Jr., 18, of Athens, Ala., won a Second Award at the 11th National Science Fair-International for his ingeniously designed system for maintaining life on other planets. He discussed his ideas with the Wernher von Braun group at the Army Ballistic Missile Agency and spent nearly 1,000 hours perfecting his project.

years old, largely inspired by his father. Next fall he will enter the University of Georgia to prepare for a career of university research in botany.

Some of the finalists apparently are self-starters. Impetus created by their own inherent curiosity, observations and private excursions into research launched 11.8% of these students.

One boy, for example, traces his beginnings to a fossil he discovered in the driveway of his home when he was five years old. This spring, Stewart Peck of Davenport, Iowa, as a 17-year-old high school senior, returned for the second time as a finalist to the national fair.

Now an ardent speleologist, he was selected by the U. S. National Park Service and the National Speleological Society as the head of a biology team which is carrying out a complete zoological study of Wind Cave, South Dakota. His work on unusual cave beetles has been published in speleological journals and his reports were presented at the national speleological convention. Stewart is looking forward to a career in zoology or geology.

Equipment Arouses Interest

The earliest interest of another 11.8% was caught by scientific equipment ranging from elementary chemistry sets and similar kits to telescopes and amateur radio equipment. Science was discovered by 7.6% in books and magazine articles, and by 5.5% through what they saw and heard at science fairs and science club meetings.

The remaining 4.4% of the group were inspired by adult scientists; television science presentations; films, trips and tours; Boy Scout activities; and similar opportunities.

David J. Wilson, Jr., 18, of Athens, Ala., for example, mulled over his ideas for physical survival on other planets, then took his plans and conclusions to the Wernher von Braun group at the Army Ballistic Missile Agency for criticism and comment. The interest and encouragement given him by these professional scientists launched David on nearly 1,000 hours of dedicated work on the project that won him a Second Award at the 11th National Science Fair-International. Chosen by the U. S. Information Agency to participate in the American entry in the Berlin Industries Fair, David and his "Survival on Mars" project will go to Germany in September.

Science Career Plans

The career plans of this group of young people include 21% in the medical sciences, 13% in physics, 12% in engineering, 10% in the biological sciences, 8% in as yet unspecified specialties, 7.6% in chemistry and 6% in science or mathematics teaching. A large proportion hope to teach at some time during their professional lives or to combine teaching and research.

Those who have chosen non-science professions and those who have made no choice at all account for an additional 6%. Careers planned outside of science include law, political science, linguistics and missionary work.

It may be predicted that most of the finalists actually will become professional scientists and/or educators. Half of them may be expected to remain in the field of their present choice.

SCIENCE SERVICE studies of former finalists show that almost all those who are old enough are attending college or graduate school, taking other types of training or engaging in professional work.

Of 352 college undergraduates in one study, 91.8% were majoring in science or education. The 8.2% of the students majoring in non-science fields had chosen religion, social sciences, art, journalism, literature, economics, commerce, music and speech. Of these already employed, about 88% were in scientific, educational or closely allied fields.

Finalists Studied

A study of 295 finalists drawn from the earliest National Science Fairs, 1950 through 1955, recently was completed by G. L. Daniels, associate professor of science at the University of Montana. His doctoral thesis, "Occupational Choices of Former National Science Fair Exhibitors," was submitted to Teachers College, Columbia University.

Done in cooperation with SCIENCE SERVICE, this detailed study shows 82.2% of the men and 63.6% of the women in scientific or science-related occupations. Various combinations of teaching and/or research are included in the plans of 76.9% of the men and 68.6% of the women.

College was attended by 96.9% of the men and 91.5% of the women in the group.

According to the report, almost 60% of both men and women stated that they were influenced in their choice of career by science fair activities.

"Others probably experienced increased awareness of science career possibilities through their participation," says Prof. Daniels.

Decisions Made in High School

Career decisions were made most frequently during senior high school years. Women were slightly more inclined to postpone definite choice until they were undergraduates in college, however. In the most frequently chosen professions of this group, more than half of the decisions came during senior high school or before. Women chemists chose their career distinctly later than men, and psychologists of both sexes made late career decisions.

Approximately half of both sexes entered the fields they had chosen in high school. Those who changed their plans usually did so when they developed new interests in college. Marriage changed the minds of 18% of the women.

Prof. Daniels found one-fourth of the women still active in their professions, one-half planning to resume their careers and one-fourth apparently lost to the occupations for which they were educated.

His data also show that over half of these talented young people came from "favored" economic backgrounds, that approximately half had at least one college-educated parent and that there was a strong preponderance of first-born or only children among the group and especially among those pursuing science careers popularly thought of as "difficult."

New Finalists Show Old Pattern

The newest additions to the roster of highly promising young scientists, the 356 finalists of the 11th National Science Fair-International, are much like their predecessors, even in their choice of hobbies.

In addition to nearly universal leisure activities in science, the hobbies listed most frequently include individual sports such as fishing, hunting, camping, tennis, swimming, hiking, skin diving and speleology; music; reading; electronics and amateur radio; collections; arts and crafts; photography and microphotography; astronomy; and team sports.

Tabulating the occupations of their fathers, 35% are listed in professional jobs, 31% in clerical-sales-service work, 18% in managerial positions, 8% in factory or unskilled jobs and 4% in farming.

A little less than one-third of their mothers are employed. Of those who work outside their homes, 53% are in professional occupations such as teaching, law and medicine; 37% are in clerical-sales-service jobs; and 6% are working in factories or doing unskilled work.

College Educated Parents

Two-thirds of the finalists come from homes where at least one parent continued his or her education beyond high school. Some college training was received by 58% of the fathers and 48% of the mothers. College was completed by 42% of the fathers and 26% of the mothers. Advanced degrees were achieved by 23% of the fathers and 7% of the mothers.

The ideas that inspired the outstanding projects exhibited at the National Science Fair-International came from a variety of sources. According to the finalists, 35% of the ideas came from their reading, 24% from their own observations and curiosity, 15% from school, 7% from scientists, 4% from science equipment and 3.5% from their families. Other sources mentioned were science seminars and summer programs, and jobs in laboratories.

Such statistics as those reported in the Daniels and SCIENCE SERVICE studies are heartening to individuals and organizations dedicated to helping science-minded young people. They offer significant support for the creative planning, effort and funds that are being invested by families, schools, communities and Government agencies all over the world.

(Copies of the summary, conclusions and recommendations contained in Prof. G. L. Daniels' report are available upon request and receipt of self-addressed, stamped, long envelope. Write Science Clubs of America, 1719 N St., N.W., Washington 6, D. C.)

• Books of the Week •

For the editorial information of our readers, books received for review are listed. For convenient purchase of any U. S. book in print, send a remittance to cover retail price (postage will be paid) to Book Department, Science Service, 1719 N Street, N.W., Washington 6, D. C.

ALGAE IN WATER SUPPLIES: An Illustrated Manual on the Identification, Significance and Control of Algae in Water Supplies—C. Mervin Palmer, introd. by Clarence M. Tarzwell—*U.S. Public Health Service (GPO)*, 88 p., illus. by Harold J. Walter, paper, $1. Suitable for biology courses in high schools and colleges.

THE ARCHAEOLOGY OF PALESTINE — William Foxwell Albright—*Penguin*, rev. ed., 271 p., illus., paper, 95¢. Up-to-date survey of the most important and interesting phases of Palestinian archæology.

ARCHEOLOGICAL INVESTIGATIONS IN BRITISH GUIANA—Clifford Evans and Betty J. Meggers—*Smithsonian Inst. (GPO)*, Bureau of Ethnol. Bull. 177, 418 p., illus., 68 plates, $4. Report on findings during field trips into the lowlands of British Guiana during 1952-53.

THE ART OF MARRIAGE COUNSELING: A Modern Approach—W. L. Herbert and F. V. Jarvis —*Emerson*, 125 p., $2.75. Principles of modern sociological teaching are applied to marriage counseling, covering also practical aspects of the work.

AUTOMATIC LANGUAGE TRANSLATION — Anthony G. Oettinger, foreword by Joshua Whatmough—*Harvard Univ. Press*, 380 p., illus., $10. Primarily concerned with certain fundamental lexical and technical problems of translation by machine, with particular reference to Russian.

BLIND CHILDREN IN FAMILY AND COMMUNITY —Marietta B. Spencer — *Univ. of Minnesota Press*, 142 p., photographs by Frank Agar, Jr., and Carol Safer, $4.25. Through the use of excellent photographs and brief, clear explanations, the author shows how parents and others can start blind children on their way to becoming useful, independent adults.

THE CHILD'S WORLD—Phyllis Hostler — *Penguin*, 203 p., paper, 85¢. Shows why children behave as they do and how we can make our behavior intelligible to them.

COLD INJURY: Transactions of the Sixth Conference, 1958—Steven M. Horvath, Ed.—*Macy*, 375 p., illus., $6.50. Among other subjects, field studies on cold adaptation and hibernation of mammals are discussed.

A COLLECTION OF ARTICLES ON DYNAMIC METEOROLOGY—I. A. Kibel', Ed.—*Am. Geophysical Union (Consultants Bureau)*, 181 p., $8. Volume 1 of "Soviet Research in Geophysics" in English translation. Describes theory for soil temperature and calculation, clouds and the atmospheric heat balance, and cooling of radiational heat exchange.

DIVING FOR PLEASURE AND TREASURE — Clay Blair, Jr.—*World Pub.*, 350 p., photographs by Walter Bennett, $4.95. Tells the story of the exploration and finding of the sunken Spanish galleon El Matanzero off the coast of Yucatan.

ELEMENTARY THEORETICAL FLUID MECHANICS —Karl Brenkert, Jr. — *Wiley*, 340 p., illus., $7.50. Stresses the rigorous derivation and application of the fundamental equations of fluid mechanics. Offers 374 problems, covering a wide variety of topics.

EXTRACTIVE AND PHYSICAL METALLURGY OF PLUTONIUM AND ITS ALLOYS—W. D. Wilkinson, Ed.—*Interscience*, 314 p., illus., $8.50. Brings up-to-date the many scientific achievements in this field, and includes a special introduction and annotated bibliography by the editor.

FIRST MEN TO THE MOON — Wernher von Braun—*Holt, Rinehart and Winston*, 96 p., illus. by Fred Freeman, $3.95. A dramatization of space travel with scientific descriptions of facts and problems of space.

FOOD BECOMES YOU—Ruth M. Leverton—*Iowa State Univ. Press*, 198 p., illus., $3.50. Informative and up-to-date guide to nutrition and diets for young persons and families.

FUN WITH MATHEMATICS—William H. Glenn and Donovan A. Johnson—*Webster Pub. Co.*, 43 p., illus., paper, 75¢. Mathematical recreations for students who want to go beyond the textbook.

THE GIANT GOLDEN BOOK OF DINOSAURS AND OTHER PREHISTORIC REPTILES — Jane Werner Watson—*Golden Press*, 60 p., illus. by Rudolph F. Zallinger, $2.95. Dramatic pictures and text introduce young people to many of the creatures of prehistoric times.

GLOSSARY OF TERMS FREQUENTLY USED IN PLASMA PHYSICS—Introduction by Elmer Hutchisson—*American Institute of Physics*, 30 p., single copies free upon request to publisher: 335 E. 45th St., New York 17, N. Y. Intended for the lay reader, gives definitions in simple scientific terms.

GROUP PROCESSES: Transactions of the Fifth Conference, 1958 — Bertram Schaffner, Ed.—*Macy*, 196 p., illus., $4.50. Includes discussion by Margaret Mead and Theodore Schwartz about the meaning of cult among the Manus people of New Guinea.

HANDBOOK OF PROGRAMS OF THE U. S. DEPARTMENT OF HEALTH, EDUCATION AND WELFARE, 1960—Office of Program Analysis, Dept. of HEW—*GPO*, unpaged, paper, $1.50. Provides general information about each program and five-year summary of fiscal, personnel and other statistics.

AN INEXPENSIVE SCIENCE LIBRARY: A Selected List of Paperbound Science Books—Hilary J. Deason and Robert W. Lynn—*Am. Assn. for the Advancement of Science*, 4th ed., 70 p., paper, 25¢. Lists more than 500 books, grouped by sciences, with brief descriptive notes and classification as to degree of difficulty.

INGENIOUS MATHEMATICAL PROBLEMS AND METHODS—L. A. Graham—*Dover*, 237 p., illus., paper, $1.45. Selection of 100 puzzles from Graham DIAL, calling for some knowledge of all branches of mathematics.

ISOSTASY AND ISOSTATIC HYPOTHESES—E. N. Lyustikh, transl. from Russian—*Am. Geophysical Union (Consultants Bureau)*, 119 p., illus., $6.50. Discusses principles of theory, isostatic status of the earth and causes of zonal anomalies.

JOURNAL OF MATHEMATICAL ANALYSIS AND APPLICATIONS, Vol. 1, No. 1—Richard Bellman, Ed.—*Academic*, 132 p., paper, quarterly, $16 per year. Publishes selected mathematical papers, particularly those in which analytical aspects and the novelty of problem and solution are emphasized.

LAND, WOOD AND WATER—Sen. Robert S. Kerr, ed. by Malvina Stephenson and Tris Coffin, introd. by Sen. Lyndon B. Johnson—*Fleet Pub.*, 380 p., photographs, $4.95. A study of conservation and the policies and programs affecting this vital problem.

MECHANICS—Keith R. Symon—*Addison-Wesley*, 2d ed., 557 p., illus., $10.50. Textbook for advanced undergraduate course in mechanics to provide a foundation for advanced courses in physics.

MEDICAL WORLD NEWS, Vol. I, No. 1—Morris Fishbein, Ed.—*Medical World Pub. Co.*, 48 p., illus., paper, 60¢; bi-weekly, $12.50 per year. A newsmagazine of medicine, with selected articles on new medical techniques, medical economics and legislation.

THE MICROSTRUCTURE AND MACROSTRUCTURE OF ELASTIC WAVES IN ONE-DIMENSIONAL CONTINUOUS NONHOMOGENEOUS MEDIA—B. N. Ivakin, transl. from Russian — *Am. Geophysical Union (Consultants Bureau)*, 113 p., $6. Originally published by the Geophysics Institute of the Academy of Sciences of the USSR in Moscow in 1958.

NATURE AND MAN—John Hillaby—*Phoenix House (Roy Pub.)*, 64 p., illus. by Jane Burton, $2.95. Gives young persons a picture of the battle for survival and man's changing attitude toward conservation.

THE NATURE OF THE UNIVERSE—Fred Hoyle —*Harper*, rev. ed., 141 p., illus., $3. Original text rearranged according to recent astronomical discoveries; the chapter dealing with the origin of the planets was completely rewritten.

PAPERBOUND BOOKS IN PRINT: Summer 1960— Olga Svatik Weber, Ed.—*Bowker*, 329 p., illus., paper, $2; quarterly, $5 per year. Author and title index of inexpensive reprints and originals, with selective subject guide.

PERSONALITY "PLUS" THROUGH DIET: Foodlore for Teen-Agers—Charles Glen King and Gwen Lam—*Public Affairs Committee*, Pamphlet No. 299, 20 p., illus., paper, 25¢ direct to publisher, 22 E. 38th St., New York 16, N. Y. Prepared in cooperation with the Nutrition Foundation, Inc.

THE PYTHAGOREAN THEOREM — William H.

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THINGS TO DO IN SCIENCE AND CONSERVATION—Byron L. Ashbaugh and Muriel Beuschlein—*Interstate*, 163 p., illus. by Tom Seagears, $2.50. Demonstrations and projects illustrating scientific concepts related to conservation of natural resources, both on elementary and advanced level.

UNDERSTANDING WEATHER — O. G. Sutton—*Penguin*, 212 p., illus., paper, 95¢. Outlines in simple terms the main features of climate and weather, explaining the methods needed to analyze the complex data of meteorology.

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WINDOWS IN THE WOODS—Heinz Sielmann, transl. from German by Sidney Lightman, introd. by E. Thomas Gilliard, foreword by James Fisher—*Harper*, 139 p., photographs, $4.95. Takes the reader with the naturalist-photographer into the woods to observe woodpeckers at close range, their nesting, breeding and feeding.

• Science News Letter, 78:156 September 3, 1960

Do You Know

The United States produces about 90% of the *timber* we use.

Dairying is the greatest single source of farm income in America today.

A *synthetic soil* for house plants, chemically treated to eliminate souring and odors, is now on the market.

The fact that an unusual blood substance in patients with *rheumatoid arthritis* is also found in the blood of their relatives raises the possibility that it may be inheritable.

BOTANY

Unnamed Peruvian Plant Has Record Chromosomes

➤ FIVE HUNDRED AND TWENTY chromosomes have been found in an unnamed plant discovered growing on Inca ruins in Peru.

Prof. Charles H. Uhl of the New York State College of Agriculture at Cornell University was sent the plant from Peru. He counted the chromosomes, which help determine heredity, and announced the plant had more than any other flowering species known.

The blue-green plant, a member of the genus *Echeveria*, will probably be around for a long time. Cornell scientists said that the plant's large numbers of chromosomes might give it a better chance of surviving an atomic war than most other living things.

• Science News Letter, 78:157 September 3, 1960

CONSERVATION

Rules Eased on Hunting Birds Over Seeded Land

➤ MIGRATORY BIRDS will be fair game during this fall's hunting season over planted or harvested agricultural lands.

Effective Sept. 1, the U. S. Department of the Interior has relaxed its restrictions on hunting methods because of late fall plantings. Under the previous rules, hunters could engage in shoots only over agricultural land on which seed might have been scattered as a result of harvesting. Unaware of fall plantings, many hunters unwittingly were violating the limited regulation.

• Science News Letter, 78:157 September 3, 1960

PUBLIC HEALTH

Red Cross to Aid School-age Chileans

➤ A LONG-RANGE PROGRAM to aid Chilean children who suffered from the earthquake disaster that rocked the nation last May and June has been announced by the American Red Cross.

As a part of the continuing Red Cross assistance to the stricken nation, a $500,000 relief program has been undertaken to assist school-age Chileans. One of the main undertakings is a $30,000 project to provide $15 a month for a period of five months to 400 of the neediest students at the University of Concepcion and the University of Austral in Valdivia.

Another project will give Chilean schools in the devastated area 150 school assistance units, chests containing educational supplies, health and sanitary items, tools and recreational equipment. These units are designed so that the export packing cases can be converted into bookcases or storage cabinets.

These and several other projects are in addition to the aid—$2,000,000 in cash and $700,000 worth of supplies—already extended by the Red Cross to Chile.

• Science News Letter, 78:157 September 3, 1960

Questions

ASTRONOMY—What is the "suburban" population of stars in a galaxy? p. 147.

PSYCHIATRY—What are some of the elements of the psychic constitution of the swindler? p. 153.

TECHNOLOGY—Why would salt water be used to collect solar power? p. 149.

Photographs: Cover, Boing Airplane Company; p. 147, U. S. Air Force; p. 149, General Dynamics Corporation; p. 151, Minnesota Mining and Manufacturing Co..; p. 154, Courtesy of David J. Wilson, Jr.; p. 160, Solar Products.

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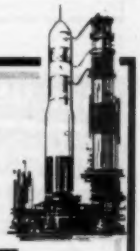

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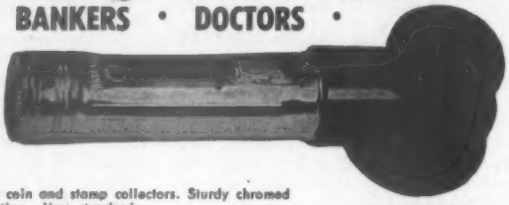

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PHARMACOLOGY

Rights and Wrongs Of Medicine Flavoring

➤ PHARMACEUTICAL manufacturers should not add flavoring to medicine the way a cook might add vanilla to a cake after everything else is in it. "Terminal" flavoring was called a mistake by a pharmacist speaking at the American Pharmaceutical Association convention in Washington.

Fred Wesley of Fritzsche Brothers, Inc., a flavor manufacturing company in New York, said his company advocates "parallel" or "in process" flavoring that is put into the product as it is developed. "Individualized" flavoring means flavoring each component part of the pharmaceutical mixture before it is combined.

He said that benzaldehyde, rather than the finished cherry-flavored mixture, is tried separately as a "fractional" flavoring that is basic. Methyl salicylate and menthol are two other basic flavorings. Taste improvers include ethyl vanillin, corisander oil and orange oil. Vanillin itself is most widely used, forming an integral part of a vast number of flavor compounds for medicines.

Mr. Wesley described "dilute tasting" as tasting medicine in a very dilute form to avoid hurting the taster's sensory keenness.

"Reverse" flavor testing means medicating the flavor instead of flavoring the medicine. All are recommended by flavor manufacturers.

• Science News Letter, 78:158 September 3, 1960

MEDICINE

Tranquilizer Raises Effects of Alcohol

➤ THE TRANQUILIZER MEPROBAMATE—sold as Miltown, Equanil, Meprospan and Meprotabs—can turn a couple of drinks into an alcoholic powerhouse, two physicians, a police sergeant and a Ph.D. found.

At different times, the four researchers gave 10 men and 12 women volunteers an innocuous drink, a drink containing only meprobamate, a drink containing enough alcohol to produce about a .05% blood alcohol level, and a drink with the same amount of alcohol plus meprobamate. (The .05% blood level is not enough to impair a person's ability to drive, according to several United States court decisions.)

The volunteers were at their worst on psychological tests after the combined meprobamate and alcohol. In the clinical judgment of two of the experimenters, the combined shot produced more intoxication effects than the alcohol alone in 16 of the volunteers.

"On the day of the combined drug dosage, four of the subjects were quite obviously drunk," the researchers report in the Journal of the American Medical Association, 173:1823, 1960.

The tests were made at the Madison State Hospital in Madison, Ind., by Dr. George A. Zirkle (Ph.D.), Drs. Otto B. McAtee and Peter D. King, all of the state hospital, and Sgt. Robert Van Dyke of the Indiana State Police.

• Science News Letter, 78:158 September 3, 1960

15 THOUSANDTHS OF A SECOND IS A VERY LONG TIME

It's much faster than you can wink an eye, yet time enough for Bell Laboratories' new high-speed switching terminal to transfer your voice to another channel while you are talking by telephone.

The new terminal—recently introduced on the transatlantic cable—uses the idle time in the conversations of talkers on a group of channels to provide paths for other talkers. This time-sharing technique, called Time Assignment Speech Interpolation, permits the sending of 72 simultaneous phone conversations over this deep-sea system where only 36 could be sent before.

TASI takes advantage of the fact that in a normal telephone conversation you actually talk less than half the time. You do not talk when you are listening, and even when you do talk there are pauses between sentences, words, and syllables. When there are more talkers than channels, TASI puts this idle time to use.

Scanning each circuit thousands of times a second, TASI instantly notices when you aren't talking, then quickly switches in someone who *is*. TASI also notices when you resume talking, immediately finds a channel not in use that moment and switches you to it. Your voice may be switched many times during a single conversation in a time too fast—about 15 milliseconds—for your ear to perceive.

The TASI switching terminal was rendered feasible by the transistor—an invention of Bell Telephone Laboratories. More than 16,000 transistors are employed to achieve the compact, dependable, high-speed circuitry required. TASI is another example of how Bell Laboratories works to keep your telephone service the world's finest.

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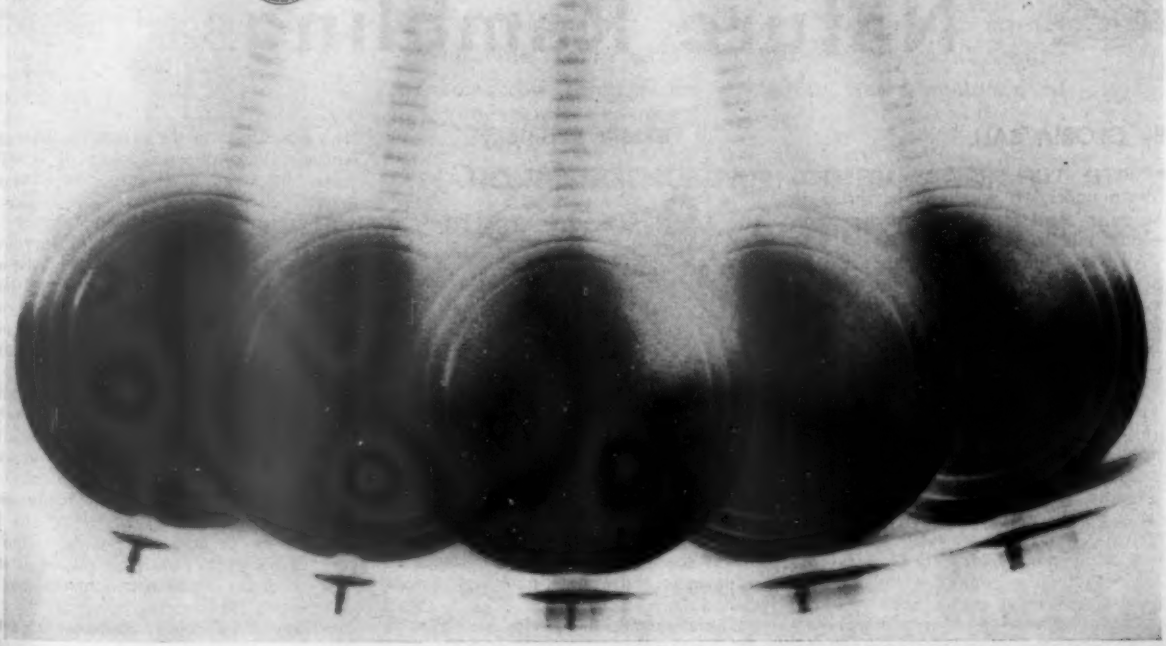

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• Science News Letter, 78:160 September 3, 1960

ILLUMINATED MAGNIFYING VIEWER for work benches allows full three-dimensional perception through a large, 6-by-6-inch plastic lens. The large-size lens eliminates eyestrain. The 4½-inch universal mounting base permits attachment to any work surface. Viewer can be swung back out of way by means of a 360-degree swivel collar.

• Science News Letter, 78:160 September 3, 1960

FISHERMAN'S KNIFE has a handle of compressed cork so it will not sink if dropped overboard. The knife has two stainless steel blades: a 3½-inch cutting blade on one side, and a 3½-inch combination fish scaler, hook disgorger and cap lifter on the other. The scaler is slightly curved, making it easier to clean fish.

• Science News Letter, 78:160 September 3, 1960

SHOE HOLDER, shown in the photograph, enables every member of the family to have professional-looking shoe shines quickly, easily, conveniently at home. The device consists of a wall attachment, a shoe

holder and an adjustable bracket that adjusts the holder to fit any size shoe.

• Science News Letter, 78:160 September 3, 1960

BABY BOTTLE THERMOMETER accurately records correct temperature of the milk in baby's bottle by transmitting heat through a copper band to the sensitive bimetal element. The pliable band readily fits any bottle and is held securely by an elastic cord. The thermometer prevents overheated bottles or scalded wrists.

• Science News Letter, 78:160 September 3, 1960

MITER BOX has a rugged one-piece aluminum casting with heavy guides and posts and adjustable stock holders. It accurately cuts 0, 7½, 15, 22½, 30 and 45 degrees, with a slotted opening for any degree setting from 0 to 45 degrees. Wood, metal, plastics, etc., can be cut with an ordinary hacksaw.

• Science News Letter, 78:160 September 3, 1960

TOY CAR is designed primarily for crippled children. Only arms are needed to propel and steer it. Fiberglas cowl and foot support is recessed to keep feet from slipping off. The three-wheeled car has a strong welded steel tube frame. It can be used by polio or cerebral palsy victims, paraplegics and other handicapped children with the use of at least one arm, since it requires very little strength.

• Science News Letter, 78:160 September 3, 1960

CHLORINE FILTER takes the chlorine out of tap water, by filtering the water as it comes out of the faucet, yet the water retains all the natural minerals. It is said to eliminate the disagreeable chemical tang of chlorine.

• Science News Letter, 78:160 September 3, 1960

Nature Ramblings

By GLORIA BALL

WITH THE SEASONS REVERSED "down under," it will soon be spring in Australia. And spring in Australia means —more rabbits.

All winter long these furry animals have gone about their business, paying little attention to each other. But as spring and the breeding season approach, a definite social order takes shape.

With much chasing and challenging, the males vie for top position in the community. They often resort to "fisticuffs," which means, in the rabbit world, thumping the opponent with the hind feet and getting in a scratch or bite if possible.

Eventually the rabbits in a given area divide up into groups of about half a dozen individuals and set up a common territory that is vigorously defended against intruders. Within the group there is a graded social order similar to the "peck order" in chickens. Separate peck orders are established for does and bucks, with the highest-ranking buck ultimately dominating the group.

Rabbit Sociology

The dominant buck goes where he pleases in the group territory. The other rabbits keep to their own areas during the day, but late in the afternoon they all move toward the "warren" inhabited by the dominant male and female for what appears to be a daily "check in."

The dominant buck's freedom also allows him access to the greatest number of females. Bucks of lesser stature mate only when the attention of the clan ruler is diverted elsewhere.

Adult females have a strong desire to associate in small groups during breeding periods and show a remarkable tendency to bear their litters within one or two days of each other. Thus they are all capable of mating again at the same time, and paternity spreads further down the peck order than it might otherwise.

Among the does, high social status is associated with a high reproductive rate. The dominant doe bears offspring most frequently; her "kittens" grow faster and have a higher rate of survival. These advantages stem from the better living conditions commanded by their social status.

When the breeding season ends and summer draws to a close, the rabbits' rigid social structure weakens and finally breaks down—until next spring.

• Science News Letter, 78:160 September 3, 1960

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Science Fair Committees are organized to conduct local and regional science fairs in cooperation with public, private and parochial school systems, colleges, research institutions, industries, professional science, engineering and educational societies, newspapers, civic clubs, museums and other agencies.

The Science Talent Search for the Westinghouse Science Scholarships and Awards, conducted by Science Clubs of America, is the pioneer top-level competition to select from the nation's high school seniors those giving promise of being the creative scientists of tomorrow. Conducted during the fall of 1960 for the 20th time, the Science Talent Search uses a science aptitude test on a nation-wide basis to select over 400 boys and girls for honors. Forty members of this Honors Group are designated Winners and are invited to Washington for a five-day Institute at which $34,250 in scholarships and awards are given.

Through special arrangement with Science Clubs of America, State Science Talent Searches are conducted in 36 states, usually by academies of science or universities.

Records of achievement of Science Talent Search winners over the years show that 100% go to college and about half of those now old enough have earned their doctorates or are about to do so.

Both of these activities, the National Science Fair-International and the Science Talent Search, are approved by the Committee on National Contests and Activities of the National Association of Secondary-School Principals.

As part of the National Science Youth Program, Science Service develops and distributes experimental kits at low cost, books and pamphlets promoting scientific experimentation; provides basic and background information in all fields of science; cooperates with many organizations in their science youth programs. Support from the National Science Foundation and other groups is obtained to materialize and implement mutual objectives in science education, particularly in secondary schools.

Other major activities of Science Service contribute to the National Science Youth Program. Science Service's service to newspapers, reaching a total circulation of over 10,000,000, informs teen-age science enthusiasts as well as the general public. SCIENCE NEWS LETTER with a growing circulation of over 70,000 reaches a select audience of non-scientists and scientists alike, including a great many students, science teachers, college professors and research scientists.

THINGS of science, experimental kits containing unusual specimens or explaining experimentally processes through which a familiar product passes, have been issued monthly for 20 years. Now being produced at 30,000 a month, these kits have introduced many young people to the joys and techniques of science experimentation. CHEMISTRY, issued monthly during the school year, brings particularly to high school teachers the latest in its important field.

"October—National Science Youth Month" was inaugurated and sponsored by Science Service as a means of catalyzing the beginning of science youth activities during the school year and enlisting the cooperation of diverse organizations engaged in science youth activities.

Science Service, 1719 N Street, N.W., Washington 6, D. C., invites the cooperation of organizations and individuals in extending science youth activities, particularly in regions where science fairs and clubs are not yet developed.

Information and suggestions will be furnished upon inquiry to Science Service.

Science Clubs of America

Active groups of young scientists, guided by sponsors to creative experiment, find that "science is fun." Today's youth are tomorrow's scientists.

APPROXIMATELY 25,000 science clubs are affiliated with Science Clubs of America. A current evaluation shows that there are active science clubs at all grade levels, although the largest number are organized on a school-wide basis in senior high schools.

The school clubs plan their activities mainly around biology, chemistry, physics, astronomy, general science, mathematics or some combination of these.

Science club membership averages 22 members, but it ranges from a somewhat exclusive-sounding roster of three members to one all-out activity involving 750 students.

Clubs are sponsored by teachers of every science subject in the curriculum. Most of the teacher sponsors are drawn from the science faculty, but some teach other subjects. General science teachers lead the list with 45%. More than 36% of the sponsors are chemistry teachers.

Clubs also are sponsored by a great variety of people who are entirely outside of the teaching profession. A random sampling turns up an accountant, a Cub Scout den mother, a dentist, an executive of a scientific supply company, a former National Science Fair finalist and a veterinarian.

About 65% of the clubs report that their members are active in science fairs. Many clubs are chiefly responsible for organizing and conducting their school fairs. Others act as student committees for the large regional science fairs in their areas.

In preparation for annual fairs, science clubs frequently program project workshops and seminars where former science fair winners and professional scientists offer suggestions on project ideas and exhibit techniques. Color slides and movies of the projects at the National Science Fair-International are shown by many clubs as a source of ideas and a dramatic set of competitive standards.

Some of the great assortment of specialized activities reported by science clubs are photography, geology, medicine, conservation, nuclear science, aeronautics, paleontology, rocketry, civil defense, meteorology, junior museum work, soil sampling, science publications, model building, pet care, mechanics and studies of scientific careers.

Most club programs and activities are planned and carried out by club members, with the sponsor acting in an advisory capacity. Such a plan allows ample scope for the development of leadership, responsibility, initiative and creative ideas among the student members. The sponsor often is able to act as liaison between the students and community organizations, school administrators, scholarship foundations, scientific libraries and professional societies. In many cases the sponsor supervises group or individual laboratory experiments.

Affiliating a club with Science Clubs of America is a very simple procedure. All that is required is a note from the sponsor indicating the club's desire to join and to receive materials and information without charge. The Sponsor Handbook, supplied free to sponsors, is revised annually to provide the latest and most complete information on activities for science-minded young people.

Fairs: National—Local

Science Fairs show graphically and effectively the magnitude of creativeness and scientific enterprise of which young scientists are capable.

THE NATIONAL SCIENCE FAIR-INTERNATIONAL has developed to its present size and scope from a beginning of 13 affiliated area fairs in 1950. Even more spectacular is the expansion of the science fair program at local and regional levels. Feeding these, or operating independently, are school fairs which have become so numerous that it is difficult to keep track of them.

A science fair is a collection of exhibits, each of which is designed to show a biological, chemical, physical or technical principle, a laboratory or other procedure, an industrial development, or an orderly collection of anything which can be fitted into the broad concept of any branch of any pure or applied science.

Every year millions of people see science exhibits shown by students at science fairs leading to the national fair.

One reason for this growing student interest in science and technology during the past decade is the exciting advance which science has made and is projecting.

Coupled with this is the awareness of educators, from kindergarten through university, that genuine interest in science is sparked at a very early age, often before the first year of school.

Scientific and technical societies, cognizant of the tremendous shortage of skilled scientists and technicians, are encouraging science fair programs for the purpose of recognizing potentials early and because through them additional motivation becomes more easily possible.

Civic and social groups find that science fairs supply an outlet for constructive creativity of youngsters. The fairs provide a purposeful use for funds accumulated in educational and other accounts.

Newspapers sense the rich educational service which fairs give to the community. They often sponsor the program and take over, or assist, promotion, arrangements and financing.

Industry sees the science fair as an exemplification of the American way of free enterprise. It lends technical experts to the cause, and helps to finance it.

School Fairs

The simplest fair is an exhibition of science projects held in the school itself. There are shown all the experiments, collections and displays that have been worked out by students either in class or as extra-curricular science club activities. These fairs often are a feature of a meeting or a showing to which the public is invited.

City-wide, Area or Regional Fairs

These large science fairs may have several hundred exhibits, viewed by thousands of people who visit an exhibition hall which may be a school or college gymnasium, an armory, a museum or other such area. Some science fairs, even in large cities, accept the maximum number of exhibits the hall will allow. In other cases, the city or area fair receives only an allotted number of exhibits from each school, which holds its own eliminations first.

Exhibitors in such fairs are rewarded by the stimulation of having their work shown and by receiving certificates of merit. Other awards, ranging from emblems to cash prizes and scholarships, may be given.

National Science Fair-International

From regional or state fairs the best exhibits made by individual students (not groups) are selected for entry into the annual National Science Fair-International.

The rules of the national fair specify that to be eligible boys and girls must be students in the last three years of public, private, parochial or other secondary schools, and must have been selected for highest honors in a regional fair affiliated with the national organization.

Each affiliated fair is entitled to send two finalists and their exhibits to the national fair, paying their expenses and undertaking responsibility for them.

All exhibits must be individual projects and must be limited in size to 48 inches from side to side and 30 inches from front to back. Identical repetition of a project exhibited by the student at a previous year's science fair disqualifies the finalist. However, the project may cover the same field of investigation when a substantial amount of continued and expanded work has been done.

Exhibits must be durable and safely designed and constructed, using approved switches and cords for 110-volt operation. No dangerous chemicals, open flames, explosives or live poisonous reptiles may be exhibited. Live animals must be properly and humanely cared for, and any experimental work that has been done with them must conform with National Science Fair-International regulations for such experiments. Plants must pass federal and state quarantine regulations.

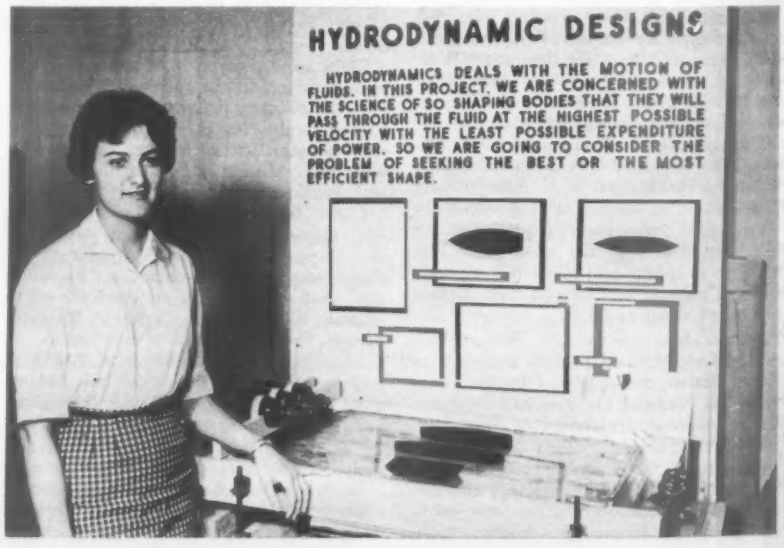
Honors and Awards

For National Science Fair-International Awards, exhibits are judged in the two general categories of biological and physical sciences, and the exhibits of girl and boy finalists are judged separately. First place awards are made to the top boy's and girl's projects in each of the two categories. Other awards are prorated according to the number of girls and boys among the finalists, regardless of the category of their exhibits.

Each finalist receives a rainbow-ribboned gold and silver medal engraved with his or her name and that of the cooperating organization. A facsimile medal on a certificate is sent to the principal of the school of each finalist to become a trophy in the school.

On the basis of critical judging outstanding finalists are given "Wish Awards"—selected scientific equipment and materials which winners have "wished for" to help them in the furtherance of their study and experimentation.

Special awards are made at the National Science Fair-International by the American Chemical Society, American Dental Association, American Heart Association, American Institute of Biological Sciences, American Medical Association, American Pharmaceutical Association, American Veterinary Medical Association, National Committee for Careers in Medical Technology, Optical Society of America, Society of American


HYDRODYNAMIC DESIGNS
HYDRODYNAMICS DEALS WITH THE MOTION OF FLUIDS. IN THIS PROJECT, WE ARE CONCERNED WITH THE SCIENCE OF SO SHAPING BODIES THAT THEY WILL PASS THROUGH THE FLUID AT THE HIGHEST POSSIBLE VELOCITY WITH THE LEAST POSSIBLE EXPENDITURE OF POWER. SO WE ARE GOING TO CONSIDER THE PROBLEM OF SEEKING THE BEST OR THE MOST EFFICIENT SHAPE.

Bacteriologists, U. S. Air Force, U. S. Army and the Association of the U. S. Army, U. S. Navy.

Judging is based on creative ability, scientific thought, thoroughness, skill, clarity and dramatic value of each exhibit. Scientists designated by Science Service judge the contest and the decision of these judges is final in all cases.

While every effort is made to prevent damage to exhibits, neither the National Science Fair-International, Science Service, the Committee of the host city nor any other sponsoring organization can assume responsibility for loss or damage.

All finalists participate in a four-day program of scientific sightseeing and meetings with leading scientists as well as the public. At the same time they become acquainted with other finalists having similar interests, compare their work and carry back to their local situations an enthusiasm and stimulation that will be reflected by others in future years.

Educationally Valuable

The whole science program is educationally sound. It allows the student to select freely the project upon which he plans to work. Automatically he leads himself through a study of the bedrock principles of his chosen topic, thus acquiring a basic, fundamental understanding of the facts and techniques involved. All elements of a stiff competition are present to urge the student to do his best, thus reflecting honors on himself, sponsors, school, city and state.

Educators and newsmen cooperating in the program of the National Science Fair-International plan the fair in a different city each year. This makes it possible for a finalist, who returns to the fair each year he is eligible, to visit three different cities, meet the outstanding scientists in each and visit them in their laboratories. Similar cultural values automatically extend to the accompanying educators and press representatives.

Regional or School Fair Rules

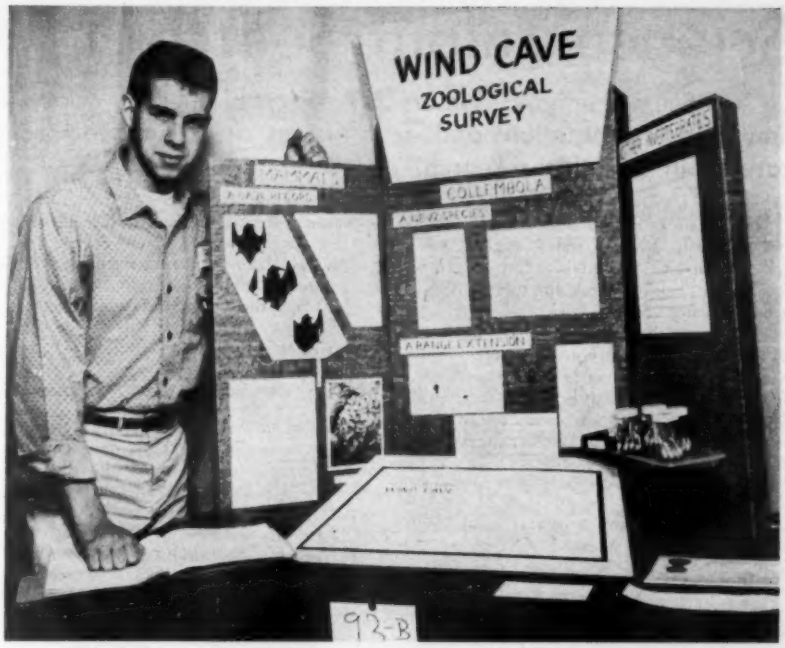
Regional and school science fairs generally use the rules of the national fair or adapt them to fit various local situations.

Depending on local rules, students may work individually or in groups. Exhibits must be designed and made by students. They may seek help from educators and others. Each exhibit should be so arranged that it can be understood by the layman without requiring an accompanying demonstration or lecture. Judgment of exhibits is based on work done by students, not on cost of accessory or incidental equipment.

How to Conduct a Science Fair

The science club sponsor or teacher, or group of sponsors or teachers, first should get permission from the principal or board of education for holding a science fair to which parents and the public will be invited.

The fair may be designed for operation in one school, or each school of a group of



schools can schedule the event to occur substantially at the same time. The best exhibits may then be presented at a final centralized place.

Fairs should be held early in the spring. If entry is arranged for finalists to participate in the National Science Fair-International, the regional fair must close early in April. Names of finalists must be reported immediately to the National Science Fair-International headquarters, at the close of the regional fair.

Regional fairs may be held in classrooms in school, in the chemistry or physics laboratories, in the school gymnasium or cafeteria, in a community building, college building, museum or armory. In fact, any place where adequate electric current facilities are available and which will accommodate crowds will prove satisfactory. If held in a hall, local police and fire departments should be advised of the event so that guards can be posted to protect the properties adequately. School events should be monitored for protection and to guide people to and from the exhibit areas.

One of the goals of the National Science Fair-International is to permit access to the national event by every student through a cooperating fair within convenient access to his or her school. Long hours of travel are a hardship for young students, and are objected to by parents.

A broad perspective should be taken in the matter of geographical or other boundaries for the fairs. If a newspaper, radio or TV station, college or university, industry or other group assists toward the financial support of any regional fair, and if any one or all of these are so situated that they normally enjoy the friendship and good will from across state boundary lines, the entire area should be considered in the plans for a regional fair.

How to Enter the National Science Fair-International

Entry to the National Science Fair-International of exhibits and the students who made them is possible only through a regional, district or state fair which is affiliated in the national fair program. Affiliation requires signing a contract with the national organization, the payment of an entry fee, and assurance that the finalists will be properly selected and sent, all expenses paid, to the National Science Fair-International, together with their exhibits. No more than two finalists may be chosen for any one cooperating fair. Exhibits must be made by individual students attending school, and must be declared best in local competition. They must be students in the last three years of secondary school.

Experiments With Animals

The basic aim of scientific studies that involve animals is to achieve an understanding of, and a deep respect for, life itself and for all that is living.

A qualified adult supervisor must assume primary responsibility for the purposes and conditions of any experiment that involves living animals.

A trained biological scientist, physician, dentist or veterinarian must directly supervise any experiment that involves anesthetic drugs or surgical procedure.

Students shall not be permitted to participate in science fairs held under the auspices of Science Clubs of America until their adult sponsors have submitted assurance in writing that the rules drawn up in consultation with biological and medical research organizations have been observed. Request complete rules from Science Service.

Science Talent Search

Science-minded seniors are offered unusual opportunity for recognition and scholarship assistance toward careers in scientific research.

MANY STUDENTS in junior high school and the early years of senior high school look forward to and prepare for entering the Science Talent Search for the Westinghouse Science Scholarships and Awards when they reach their senior year of high school. This competition discovers, with essential educational cooperation, the youth of America whose scientific skill, talent and ability indicate potential creative originality. Science club and science fair activities have proved to be excellent preparation and background for success in this scholarship competition.

The Science Talent Search is conducted annually by Science Clubs of America as an activity of Science Service in cooperation with the Westinghouse Educational Foundation. It is open to boys and girls who are seniors in public, private or parochial schools in the United States, but excluding U. S. possessions, who are expected by the certifying school officials to complete college entrance qualifications before the following October. Students must not have competed in any previous Science Talent Search.

Each year an Honors Group of approximately ten percent of the fully qualified entrants is chosen for special recognition. Members of the Honors Group receive certificates and recommendations to the colleges and universities of their choice. These recommendations usually result in acceptance of the students for admission as well as scholarships and other financial assistance offered by colleges and universities seeking students of unusual promise in science.

From the Honors Group, the top 40 winners of the Science Talent Search are chosen. These winners are invited to attend the Science Talent Institute held for five days each spring in Washington, D. C., with all arranged expenses paid. During the Institute they are judged for five scholarships of $7,500, $6,000, $5,000, $4,000 and $3,000, and 35 Awards of $250 each.

Each winner receives a bronze Science Talent Search Plaque to be presented to the permanent honors and trophy collection of the winner's school.

Each member of the Honors Group receives a Science Talent Search Certificate signifying the honor. The Certificate, suitable for framing, is sent to the school for presentation to the student. It becomes his or her property.

Committees of judges designated by Science Service judge the contest, and the decision of these judges is final in all cases.

A scholarship may be applied toward a course in science or engineering at a college or university chosen by the winner and approved by a scholarship committee named by Science Service. Science and engineering courses must be within the fields of activity of the National Academy of Sciences and the National Research Council. If a scholarship winner withdraws from college, or if the Scholarship Committee disapproves further use of the scholarship because of reports from the college of unsatisfactory progress, any further benefits from the scholarship are forfeited.

Entering the Science Talent Search

To enter the Science Talent Search the senior takes the science aptitude examination in his own school under the supervision of his sponsor, teacher or other authorized school official. Such persons also prepare recommendations and see that the scholastic record is transmitted. The student writes a report of about 1,000 words on "My Scientific Project." This should involve original work. Entrants should develop a project that is planned for the Search or adapt to the Search something they already are doing.

Science teachers and school officials qualified to administer the examination may request entry materials for any number of eligible students. Entry blanks are mailed from Washington about Nov. 15. The examinations must be administered early in December.

All entries in the Annual Science Talent Search must reach headquarters of Science Clubs of America in Washington, D. C., by midnight, Dec. 27.

Girls as well as boys are encouraged to enter the Science Talent Search. The number of girls chosen for honors is determined by the proportion of girls who complete entries.

Search Winners Succeed

One of the most frequent questions asked is, "Do Science Talent Search winners really become successful scientists?"

The winners all have attended or are attending college. With rare exceptions they proceed to bachelors' and about 50% of those who have had time have doctors' degrees. The education of these winners has been supported liberally by scholarships and fellowships. Advanced study on fellowships takes many of them abroad.

Membership in such honorary fraternities as Tau Beta Pi, Phi Beta Kappa and Sigma Xi is so frequent as to be almost standard.

Publication of their work in various scientific journals increases as they proceed with education and research.

Almost every known science has at least one winner specialist. Physics has attracted the largest number. A very small minority choose non-science fields for their careers.

The largest group prefers academic research and teaching. As professors they often have more recent winners in their classes or working as their research assistants.

The second largest number now working full time is in industry. Research is the most frequent assignment but a few are in sales, production or administration.

Offers of summer employment in research laboratories come to all 40 as soon as they are named winners.

Almost all earlier winners have served in the armed forces but later ones, in general, have been deferred until their education is completed.

Most of the older winners are married and many have four or five children. Science Talent Search women tend to marry scientists and engineers of comparable training or more. The men do not so frequently choose mates in those fields but all have college-trained wives, frequently with degrees to match their own.

All women have worked before marriage; many afterward. Those retired to care for their children express the desire to resume their careers later. Meanwhile they keep up their science themselves and through their husbands' work.

By entering the national Science Talent Search, students automatically enter a state search, if one is held in their state, at the close of the national competition.

Science Talent Search Aids

Back issues of Science Talent Search science aptitude examinations and answers are available as long as the supply lasts. Specify the year desired. The price is 15c per copy, answers and passing scores included.

Send 50c to cover postage and packing of a bundle of four different past Science Talent Search booklets containing abstracts of winners' papers and other information.

How to Do a Science Project

Read widely—Your success with science projects depends largely on how much you know about your subject. Wide reading broadens your understanding of the possibilities and limitations of your project. Search your school, public, and nearby university, college and specialized libraries for publications in your project field. Librarians are most willing to help you.

Question others—Scientists draw heavily upon the knowledge of others in their own and related fields. Acquire the habit of consulting with others about your plans. Often a classmate or an adult can point out an error in your thinking or suggest a method which might take you many hours to detect otherwise.

Professional scientists and technicians are always glad to help answer your questions if you follow simple rules of courtesy such as querying them when they have time to answer and questioning them only when you have done enough reading and thinking to be able to ask intelligent questions. If you do not abuse their kindness you may, like other young scientists, find adults eager to lend you not only suggestions, but also equipment, books, publications, etc., that you might not otherwise be able to secure.

It even helps to talk over your project with an intelligent person who knows nothing about your work. In attempting to explain it to him you will be forced to clear your own thinking and his questions may point out areas that need more attention for the sake of clarity.

Plan carefully—Scientists save much time and money by planning so thoroughly that the actual experimenting goes through with a minimum of failure. Try to anticipate the difficulties you will encounter and forestall as many as possible by deliberate planning.

Set up effective controls and keep complete records of all your work, both successful and apparently unsuccessful.

And some don'ts—

Don't write some organization to send you everything it has on the subject, or expect the staff to do your project for you.

Don't tackle such a large project that you have time only to build the instrument you plan to use. If you must build an instrument that you have not tried to build before, better limit your project to that, and present a completed job.

Don't become discouraged. See your project through to a logical stopping point.

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Static Electricity—Sparks from your fingertips when you walk across a carpet and touch metal? On a cold, dry day you can experiment with the phenomena of static using the materials in this unit. Gives understanding of some of the fundamental facts of physics. 17 experiments.

Straight Line—Can you draw it freehand? Did you know that it is a curve? James Watt not only invented a steam engine but also the first linkage, used in guiding a piston in a straight line, which you can assemble out of this unit. A fascinating assemblage of 30 pieces of material with which you can draw your own original straight line and other curves.

Make Your Own Electric Motor—No better way to understand how electricity does work and the role played by magnetism. Full assembly directions of all parts—20 of them.

Cloth Without Weaving—For the future, textile-like materials that have never seen a loom. Actually, non-woven fabrics have been known for some time—felts made from fur, hair or wool. But now there are new types of such fabrics, made from vegetable and synthetic fibers. You can feel them, test them, use them and imagine clothes of tomorrow that are so cheap that they can be discarded instead of washed.

Hexaflexagon?—You can do tricks with it and learn about mathematical forms even if you have never heard of it (and cannot find it in your dictionary). Just how to fold paper into startling structural patterns. Everything you need for nine experiments.

Twirl This Color Top—Discover for yourself the laws of the mixing of colors. Usually science laboratories spend many dollars for apparatus with which to perform color experiments. Test yourself: Red and green make what? 27 experiments.

Rainbows Produced at Your Command—The heart of the Spectroscope, which you can put together with this unit, is a replica diffraction grating. You can demonstrate as Newton did in his classic experiment that white light is made up of all the colors of the spectrum. 13 experiments.

Stars and Constellations—Can be located and observed with the aid of this star-finder. Planet table allows you to locate other members of the solar system. Make a simple planetarium. A first step to astronomy study. 10 experiments.

Exotic Butterflies—Unusual imported specimens of colors and species not seen in the United States. Discover the world of Papilionoidea. A starting collection for a young biologist. Yellows, reds, iridescent grays and browns—from Taiwan. Full scientific descriptions. 11 experiments.

Measurement—The basic fundamentals of all the sciences—length, volume, weight—are simply demonstrated. Make a beam balance. Compare the English and metric systems. 12 experiments.

Optical Illusions—Seeing is often deceiving. You cannot always trust your eyes. A set of 14 drawings shows how misleading figures can be. Bird in a cage, distorted room, the window shape and other illusions. 21 experiments.

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Crystals—Can be used to help tell the composition of chemicals. You never see table salt in anything other than a cubic form. Samples of chemicals typical of crystal systems. Patterns for crystal models. 13 experiments.

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Students—Not only will these experiments be fun, but they will help get you started on science projects for clubs and fairs.

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